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In general, in birds the vestibule is very small, while in reptiles it is the largest part of the labyrinth. In some respects the canals in the avian labyrinth show greater resemblance to those in the mammalian labyrinth than to those in the majority of reptiles.

The book is concluded by a brief description of the labyrinths of reptiles and amphibia. Dr. Gray points out that the typical reptilian labyrinth of the present time is by no means so similar to that of birds, as many anatomists seem to think. The labyrinth of the alligator is very different from the typical reptilian organ. In reptiles the cochlea is relatively small, and is drawn out in the form of a cone, except in the teguixin and the alligator, where it has more of a tube shape. The vestibule is the bulkiest portion of the labyrinth, and contains a well-developed otolith apparatus. The canals are distinguished from those of birds, mammals and amphibians by their angularity and comparative straightness of outline. The horizontal canal, however, has a curved outline as in other divisions of the vertebrates. The canals are not set in planes at right angles to one another, but are frequently in planes which are parallel to one another, or at angles of forty-five degrees. This is of importance in view of theories which have been advanced as to the functions of the canals.

The description of the labyrinth of the amphibians is limited to two examples, both belonging to the anura. The author states that since the organ varies considerably in different species a much larger amount of material would be required to give an even fairly complete description of the labyrinth of the amphibians. The descriptions given of the labyrinths of the giant toad and the tigrine frog are interesting for the sake of comparison with those of higher forms.

As in the preceding volume, very valuable tables of measurements of the various labyrinths studied are given.

Dr. Gray is to be congratulated upon the important contribution which he has made to this valuable field of comparative anatomy.

C. R. B.

A Text-Book of Physiological Chemistry.

By OLOF HAMMARSTEN. Translation from the Sixth German Edition, by JOHN A. MANDEL. Fifth Edition. New York, John Wiley and Sons. 1908. Pp. 845.

Professor Hammarsten's "Physiological Chemistry" continues, in its successive editions, to rank as the most successful and reliable of the current text-books, if it is not also the most popular among them. One gains a good impression of the rapid advances which chemical physiology has experienced in recent years by comparing the first German edition of 1890—a book of 400 pages—with the present translation of its latest successor. Familiar defects of text-books on progressive "laboratory sciences" have consisted in the failure to keep abreast of the advances in knowledge and in the tendency to present the subject—physiology in particular—in a cut-and-dried, dogmatic fashion. One can only admire the industry of Professor Hammarsten in maintaining a thoroughly up-to-date record. In contrast with several of the American and German books in the same field, his volume shows both range and perspective in a degree which is attributable to the author's long experience and broad scholarship. But in addition to all this, the treatment is peculiarly *suggestive*, so that the reading of any chapter will bring to even the younger student some appreciation of the present evolutionary stage of physiological chemistry and of the problems which present themselves on all sides. A review of scientific evidence may not furnish an ideal compendium for "preparing for examinations." It is, however, eminently superior to a dogmatic text in affording an appreciation of the way in which physiology develops.

The successive editions of Hammarsten's book seem to the reviewer to embody a gradually improved critique in the elimination of accumulated data of uncertain value. Furthermore, it is encouraging to find in a foreign compilation some adequate recognition for the work of American biochemical investigators.

Hammarsten's text-book can not be said to

present the novelty of viewpoint which is peculiar to parts of books such as those by Bunge and Abderhalden. The element of propaganda is nowhere present; but as an orderly arranged storehouse of contributions to the literature it remains unsurpassed. Many of us have learned to depend upon Hammarsten's "Physiological Chemistry" as a reliable help of almost cyclopædic comprehensiveness. Both the author, on the eve of his retirement from active teaching, and the translator have rendered a further useful and creditable service.

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Devonic Fishes of the New York Formations.

By CHARLES R. EASTMAN. New York State Museum, Memoir 10. Albany, New York State Education Department. 1907. Pp. 1-235, plates 1-15.

This is unquestionably the most important contribution to the study of American fossil fishes since the publication of Newberry's classic monograph nearly two decades ago.¹ It embodies the results of years of painstaking research; is carefully elaborated, beautifully illustrated and, like everything else from Dr. Eastman's pen, clearly and interestingly written.

It is, of course, out of the question to attempt here a discussion of the many novel facts and interpretations in which the memoir abounds. We may only touch here and there upon some point of special importance.

One of the valuable features of the memoir consists in the large number of new forms and new localities that are put on record. The most noteworthy among these, perhaps, is that of the discovery in America of the genus *Asterolepis*. This is represented by only a single armor plate, unfortunately, but the figures and description leave no doubt that the specimen is an *Asterolepis*. It comes from a lower Devonian horizon (Chapman sandstone of Maine)—a circumstance of high importance; for inasmuch as all the European

species² of *Asterolepis* have come from the Upper Devonian, the present specimen carries the history of the genus farther back in time than hitherto known. It proves, too, that the organisms of the antiarchan style of structure attained high specialization as early as the Lower Devonian, when they were already represented by three genera, *Asterolepis*, *Pterichthys* and *Microbrachius*, thus making almost positive the indication that the ancestors of the Antiarcha may one day be discovered as far back as the Upper or Middle Silurian.

There are also described a new species of *Ptyctodus*, one of *Machæracanthus*, one of *Cladodus*: the last, represented by a tooth from the Middle Devonian of Ohio which is declared to represent the oldest cladodont shark yet known (p. 62). Judging by its size one must infer that the cladodonts of that early day had already taken on goodly proportions.

Among arthrodiran "fishes" an interesting small dinichthyid is described, *Dinichthys dolichocephalus*; a new *Glyptaspis*, and a new genus *Protitanichthys*. In connection with this new genus, the type of which (a cranial shield) I have had the opportunity of examining, thanks to the kindness of Dr. Eastman, I regret that I can not put myself in accord with the interpretation given by the author. Dr. Eastman regards this form as a primitive *Titanichthys*—chiefly because the head shield has a pineal element that is broader than long. But this fact, in the reviewer's opinion, is rather inadequate proof that the species is a Titan. *Titanichthys* is not the only Arthrodire with an abbreviated pineal, Dr. A. S. Woodward having long since shown the presence of such a pineal in *Phlyctænaspis*.³ And, moreover, a careful study of the type specimen shows the pineal to be really elongated as in typical coccosteids. What Dr. Eastman figures as the posterior suture of the abbreviated pineal, I am convinced, is

¹With the reservation indicated by Eastman (p. 40, foot-note), in favor of the obscure fragments described by Pander from the Silurian of the Baltic provinces.

²*Geological Magazine*, Vol. IX., 1892, pl. i, fig. 8.

³"The Paleozoic Fishes of North America," Monograph U. S. Geol. Survey, XVI., 1889.